Carrier Air Conditioning Company

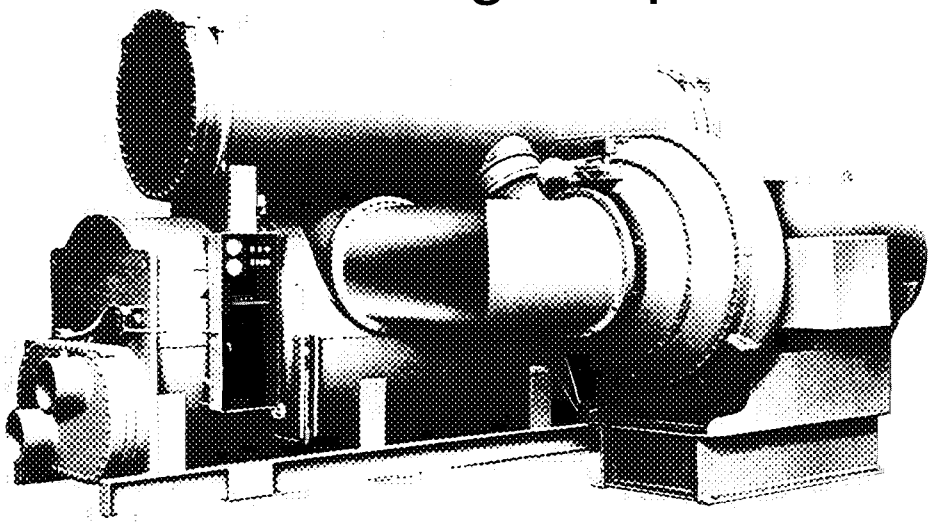
Division of Carrier Corporation

Carrier

Initial Start-Up Instructions

19CB

Hermetic Centrifugal Liquid Chillers



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INTRODUCTION

General – All persons involved in start-up and operation of the 19CB machine should be familiar with these instructions and all necessary job data before initial start-up. Instructions are arranged in proper sequence for machine start-up.

Job Data Required

1. List of applicable design temperatures and pressures
2. Machine assembly, wiring and piping prints
3. 19CB Installation Instructions
4. 19CB Operating and Maintenance Instructions

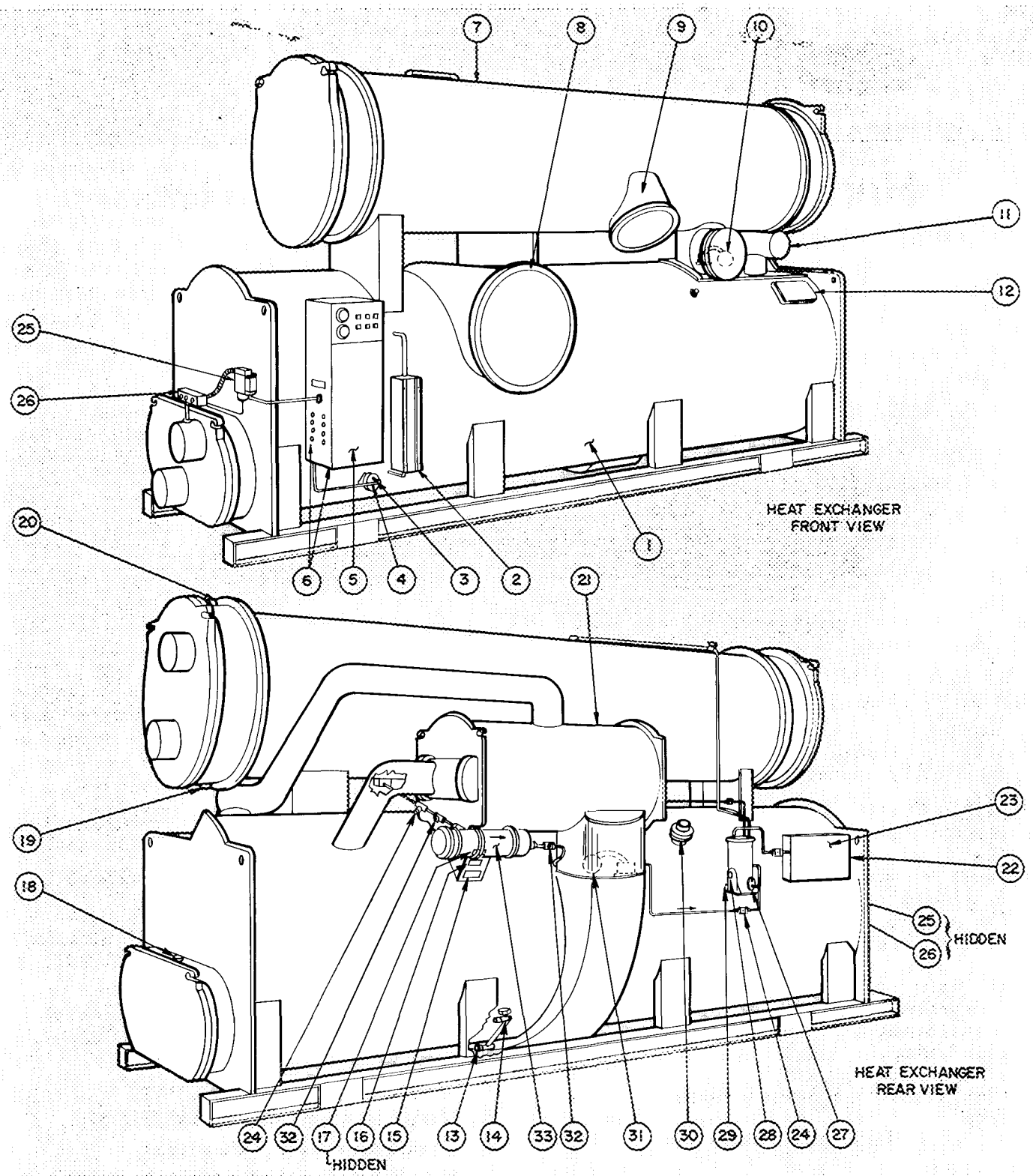
Equipment Required

1. Mechanic's tools
2. Volt-ohmmeter and clamp-on ammeter
3. Manometer, absolute pressure type
4. Leak detector, halide or electronic
5. Refrigerant drum charging valve (Fig. 5)
6. 5/8-in. SAE x 3/4-in. MPT adapter
7. Five to ten ft of copper tubing or plastic hose to fit 5/8-in. SAE connections
8. Portable vacuum pump

INITIAL PREPARATION

CAUTION: Do not start compressor or oil pump, even for a rotation check, unless compressor is charged with oil and machine charged with refrigerant.

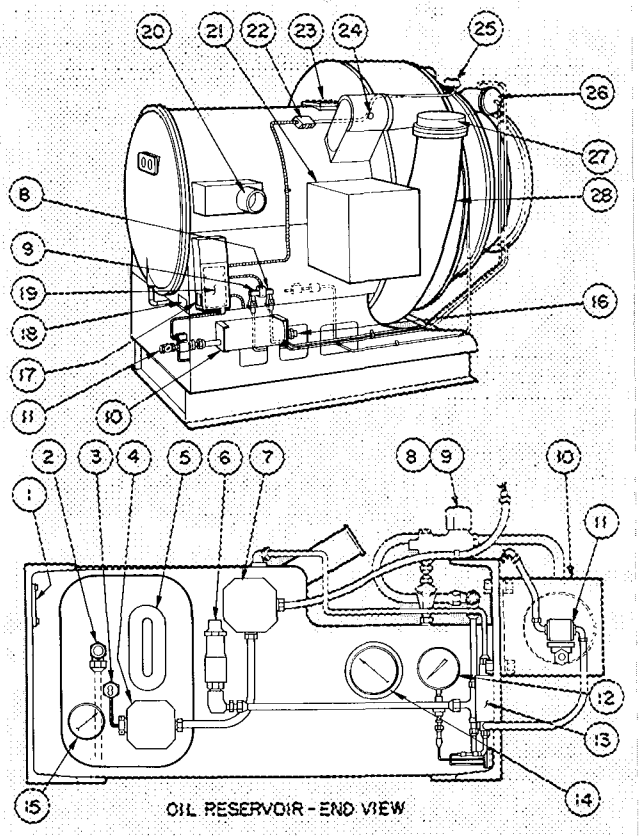
Do not apply voltage of any kind while machine is under dehydration vacuum.



LEGEND

1 — Cooler
2 — Cooler Refrigerant Level Sight Glass
3 — Low Refrigerant Temperature Bulb
4 — Thermometer Well
5 — Machine Control Center (See Fig. 6.)
6 — Knockouts for Field Wiring
7 — Condenser
8 — Cooler Suction Pipe
9 — Condenser Discharge Pipe
10 — Condenser Float Valve
11 — Economizer Pipe
12 — Cooler-Economizer Equalizing Damper Access Cover
13 — Refrigerant Connection, 1 1/2 NPT
14 — Cooler Charging Valve, 3/4 NPT
15 — ASME Nameplate
16 — Machine Informative Plate
17 — Safety Code Sticker
18 — Cooler Waterbox Vent, 3/4 NPT
19 — Condenser Waterbox Drain, 3/4 NPT
20 — Condenser Waterbox Vent, 3/4 NPT
21 — Economizer
22 — Purge Operating Switch
23 — Purge Condensing Chamber
24 — Filter-Drier Shutoff Valve
25 — Chilled Water Low-Temp Cutout
26 — Chilled Water Temp Probe
27 — Purge Refrigerant Level Sight Glass
28 — Purge Water Level Sight Glass
29 — Purge Water Drain Valve
30 — Rupture Disc Assembly
31 — Economizer Float Valve
32 — Moisture Indicator
33 — Filter-Drier

Fig. 1 — 19CB Machine Components (R-114 Unit Shown)



LEGEND

1 Serial Number Identification Plate
2 Oil Charging Valve
3 Oil Heater Thermostat
4 Oil Heater Terminal Box
5 Oil Reservoir Sight Glass
6 Oil-Pressure Regulating Valve
7 Oil Pump Terminal Box
8 "F" Solenoid Valve
9 "G" Solenoid Valve
10 Oil Cooler
11 Water-In Conn, Solenoid Valve and Plug Cock
12 Oil-Pressure Gage
13 Oil-Pressure Differential Switch
14 Bearing Temperature Gage
15 Oil Temperature Gage
16 Oil Cooler Water-Out Connection
17 Oil Pump Nameplate
18 Compressor Nameplate
19 Compressor Junction Box
20 Economizer Inlet
21 Compressor Motor Terminal Box (Far side on most models)
22 Motor and Brg Hi-Temp Cutout Junction Box
23 Main Bearing Inspection Cover
24 Economizer Damper Connection (R-114 only)
25 Guide Vane Indicator (Electronic Control)
26 Hydraulic Vane Motor
27 Discharge Stubout
28 Discharge Pipe

Fig. 2 — Compressor (Electronic Capacity Control)

Machine Tightness — If machine leak testing and dehydration was not completed at installation, check machine tightness (including pumpout system) as described below. Dehydration must be repeated if machine has been idle for several weeks after initial dehydration.

Check for Large Leaks — Using one of the methods described below, pressurize the machine to the level listed in Table 1. *Do not exceed test pressure* Listen for large leaks as the pressure builds up. If test pressure holds for one hour, proceed with Check for Small Leaks.

All 19CB machines may be pressurized with cylinders of dry air or nitrogen thru the cooler charging valve. Dry air or nitrogen charging is preferable to purge or pumpout charging as it ensures that moisture will not be introduced into the machine. To pressurize with nitrogen (or dry air):

1. Connect a copper tube from charging valve to pressure cylinder. Never apply full cylinder pressure to the pressurizing line. Follow steps 2 thru 5 in proper sequence.
2. Open cooler charging valve fully.
3. Open cylinder regulating valve slowly.
4. Observe cooler or condenser pressure gage and close cylinder regulating valve when pressure reaches test pressure listed in Table 1.

Do not exceed test pressure!

5. Close cooler charging valve. Remove copper tube.

R-11 machines may be pressurized with the purge pump. Ensure that electrical supply to purge pump is 120 volts. Then follow Operation 3 on the purge valve chart.

R-114 machines may be pressurized with the pumpout unit This method is detailed in the section entitled Pumpout Procedures.

Table 1 — Test Pressures

REFRIGERANT	TEST PRESSURE
R-11	8 - 10 psig
R-114	30 - 35 psig

Check for Small Leaks

1. Pull a vacuum equal to 5 in. Hg (12 5 psia) by using purge pump Operation 2 (R-11 machines), pumpout unit (R-114 machines) or by applying a vacuum pump at the cooler charging valve.
2. Charge approximately 25 pounds of the proper refrigerant thru the cooler charging valve.
3. Pressurize machine to test pressure (Table 1) using purge pump, pumpout unit, dry air or nitrogen. *Do not exceed test pressure*
4. Test all joints, valves, fittings etc. with a halide or electronic leak detector.

Check Leakage Rate

1. Install a mercury manometer (absolute pressure type) on a tee at the cooler charging valve.
2. Pull 25 in. of vacuum on the machine.
3. Let machine stand with this vacuum for at least 8 hours
4. If leakage rate is less than 0.1 in. Hg in 24 hours (0.033 in. Hg in 8 hrs), machine is sufficiently tight. Perform Machine Dehydration.
5. If leakage rate exceeds 0.1 in. Hg per 24 hours, repeat Check for Small Leaks, repair leaks and repeat this Leakage Rate check.
6. Remove or valve off manometer before repeating any pressure test.

Machine Dehydration

WARNING: Do not attempt to start compressor, oil pump or purge motor even for a rotation check, nor apply test voltage of any kind while machine is under dehydration vacuum. Motor insulation breakdown and serious damage may result.

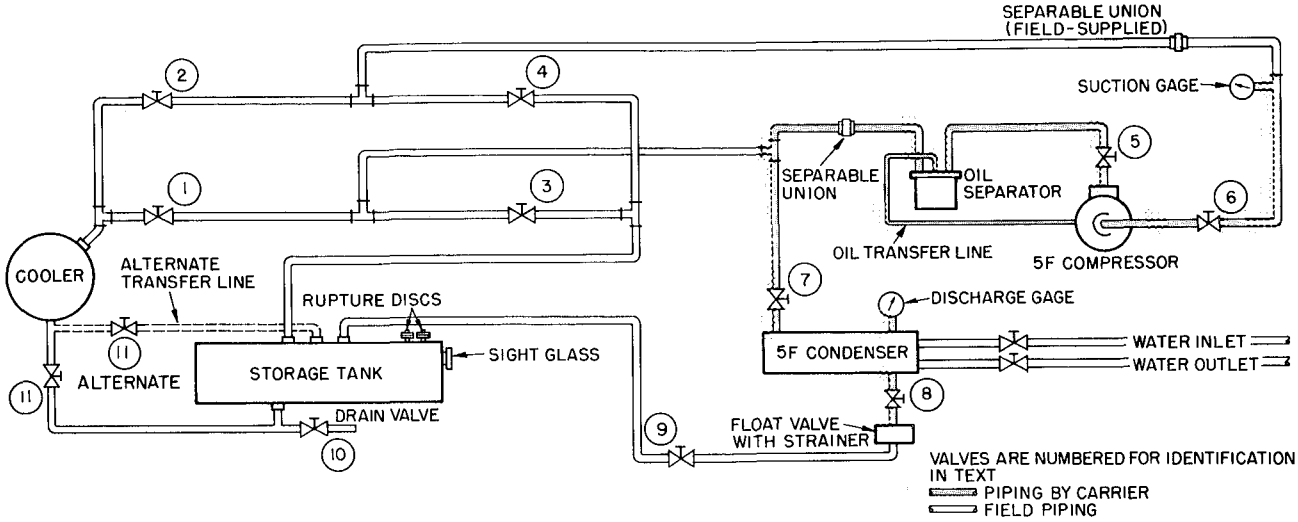


Fig. 3 — Pumpout System Schematic (R-114 Units)

1. Connect dehydration pump to cooler charging valve.
2. Ensure that all valves on purge assembly are closed; valves on filter-drier system open.
3. Install mercury manometer (absolute pressure type) at charging valve.
4. Operate pump until manometer reads 0.20 in. Hg absolute. Continue to operate pump for 2 more hours.
5. Close cooler charging valve; stop pump; record manometer reading.
6. Wait 2 hours and read manometer again. If absolute pressure reading has not increased, dehydration is complete. If absolute pressure has increased, repeat steps 4, 5 and 6.
7. If vacuum fails to hold after several dehydration attempts, check for machine leak by repeating the Check for Small Leaks.

Pumpout Procedures (R-114 Units)

MACHINE EVACUATION (No refrigerant in system)

1. Set purge valves per Operation 5 on purge valve operation plate.
2. Jumper low-pressure cutout on pumpout compressor.
3. Close valves 1, 3, 7 and 10.
4. Open valves 2, 4, 5, 6, 8, 9 and 11
5. Disconnect separable union between pumpout condenser and oil separator.
6. Run pumpout compressor until desired machine vacuum is reached.
7. Close valve 5 and reassemble union.
8. Stop compressor.
9. Remove jumper.

PRESSURIZING THE MACHINE (No refrigerant in system)

1. Set purge valves per Operation 4 on purge valve operation plate.
2. Close valves 2, 4 and 10.
3. Open valves 1, 3, 5, 6, 7, 8, 9 and 11.
4. Disconnect separable union in pumpout compressor suction line.
5. Operate pumpout compressor until desired pressure is reached. *Do not exceed test pressure listed in Table 1.*
6. Shut off pumpout compressor
7. Reassemble union.
8. Return purge valves to "Normal-Auto" condition when pressurizing is completed.

Oil Charge — Use oil shipped with machine. This oil conforms to Carrier's oil specifications for hermetic centrifugal compressors.

Charge oil thru the oil reservoir charging valve. Machine vacuum will draw the oil from the container. Add oil until it reaches the middle of the oil sight glass. *After charging, close valve completely to prevent air from entering machine.* R-114 machines containing refrigerant will require a small hand pump for oil charging.

On pneumatic machines, add oil to the vane seal chamber thru pipe plug opening (see Fig. 4) until level reaches bottom of rack and gear as seen thru Plexiglas cover.

Oil Heater — Check for 120 volt supply. Energize oil heater to minimize oil-refrigerant absorption. A light indicates when the heater is energized. The oil heater thermostat is set to maintain a temperature of 140 F ± 3 F at shutdown. Adjust if required.

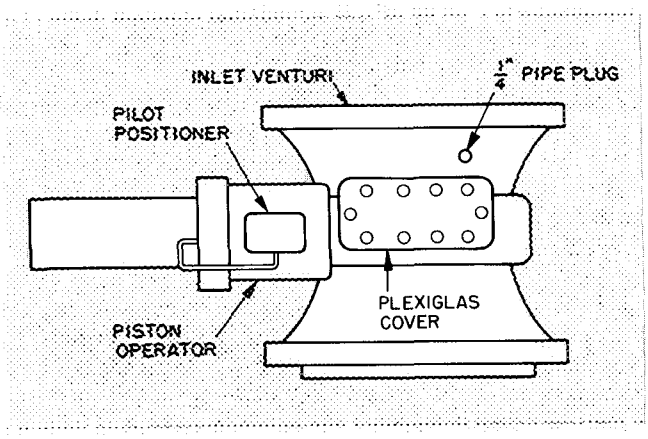


Fig. 4 — Pneumatic Vane Shaft Seal Chamber

Refrigerant Charge

1. Install a charging valve in the 3/4-in. drum opening as shown in Fig. 5.

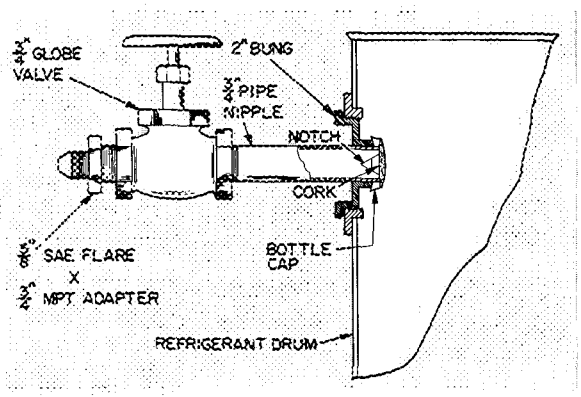


Fig. 5 — Drum Charging Valve

2. Connect a short length of plastic hose or copper tubing from drum valve to cooler charging valve.
3. Circulate chilled water during the charging process.
4. At a pressure less than that indicated in Table 2, liquid refrigerant will flash into gas and may cause tube freeze-up. Keep refrigerant drum upright and admit refrigerant as a gas until cooler pressure is greater (smaller value of in. of mercury vacuum) than that listed in Table 2.

Table 2 — Pressures Corresponding to 32 F Saturation Temperature

REFRIGERANT	PRESSURE – INCHES OF MERCURY VACUUM
R-11	18 05
R-114	3 85

5 The refrigerant supplied with the machine is in excess of the amount required for initial charging. Charge the amount shown in Table 3, *less 200 pounds*

6. After the machine has been started, it may be necessary to adjust the charge for optimum machine performance. For this adjustment, see Trimming Refrigerant Charge.

Table 3 — Refrigerant Shipping Charges

MACHINE SIZE Model No.	or Heat Exch Combn*	REFRIG	SHIPPING CHARGE
19CB1200	19CB33-36	R-11	3200
19CB1300	19CB33-36	R-11	3200
19CB1400	19CB43-46	R-11	3750
19CB1500	19CB53-56	R-11	3750
19CB1600	19CB64-66	R-11	4000
19CB1800	19CB77-78	R-114	5400
19CB2000	19CB87-88	R-114	5400

*First 6 digits of 10-digit Machine Model code

Inspect Piping

Refer to piping diagrams provided in Job Data and inspect piping to cooler, condenser and oil cooler.

Chilled water should enter the lower nozzle of the cooler and leave at the upper nozzle. Chilled water temperature probe should be installed in leaving chilled water line.

Condenser water should enter the upper condenser nozzle and leave at the lower.

Insure that pipes are vented and properly suspended, with no stress on nozzles or on water box covers.

Check to see that water flow agrees with design flow. Pressure drop measurements across cooler and condenser or across the pumps will indicate approximate flow rate.

Oil cooler water must be clean, with 85 F maximum temperature and 200 psi maximum inlet pressure. Refer to tag attached to the inlet line for pressure drop and velocity limits.

Field Wiring

WARNING: Do not attempt to check high voltage supply without proper equipment. Serious personal injury can result.

Refer to Job Data wiring diagrams and check field wiring as follows:

1. Connect voltmeter across incoming power wires to compressor motor starter. Compare the reading with voltage ratings on compressor and starter nameplates.
2. Check that amperage rating on starter nameplate matches full load amperage rating on compressor motor nameplate.
3. Ensure that voltage to oil pump starter agrees with oil pump nameplate value.
4. Ensure that pumpout compressor voltage supply agrees with motor nameplate.
5. Check that electrical supply to purge pump (R-11) is 120 volts.
6. Test compressor motor and motor power lead insulation resistance with a 500 volt insulation tester such as a megohmmeter.
   a *Open starter main disconnect switch.*
   b. With tester connected to the motor side of the starter contactor in the starter, take 60-second and 10-second megohm readings as follows·
   Six lead motor – Tie all 6 terminals together and test between terminal group and ground. Next, tie terminals in pairs, 1 and 4, 2 and 5, 3 and 6. Test between each pair while grounding the third pair.
   Three lead motor – Tie terminals 1, 2 and 3 together. Test between terminal group and ground.
   c. Divide the 60-second resistance reading by the 10-second reading. This ratio, or polarization index, must be 1.15:1 or higher. Both the 10-second and 60-second reading must be at least 5.0 megohms. If the readings are unsatisfactory, repeat the test at the motor terminals with power leads disconnected. Satisfactory readings in this second test indicate that the fault is in the motor leads.

Check Starter – Before starting the 19CB machine, *open the main disconnect* and check starter.

1. Remove contactor arc chutes. Be sure contactors move freely and that shipping string has been removed. Replace arc chutes.
2. Check contactors for dirt and rust. Clean contact magnet surfaces lightly with sandpaper. Do not sandpaper or file silverplated contacts. Apply a very thin coat of petroleum jelly to magnet surfaces and then wipe it off. If starter has been in a dusty atmosphere, vacuum clean the cabinet and wipe with lint-free cloth.
3. Remove fluid cups from magnetic overload relays. Add dashpot oil to cups per instructions on relay nameplate. Oil is shipped in small vials usually attached to starter frame near the relays. Use only dashpot oil supplied with starter. *Do not substitute.* Overload relays are factory set for 108% of motor full load amperage. Resetting is not normally required, nor is it recommended except by a qualified electrical shop.
4. Check transfer timer for proper setting. On Star-Delta starter, timers have adjustable range of 10 seconds to 3 minutes and are factory set for 1 minute. Auto.-Transformer timers have adjustable range of 1 to 60 seconds and are factory set at 30 seconds.
5. With main disconnect open, manually open and close the main control relay (1CR) to be sure it operates freely.

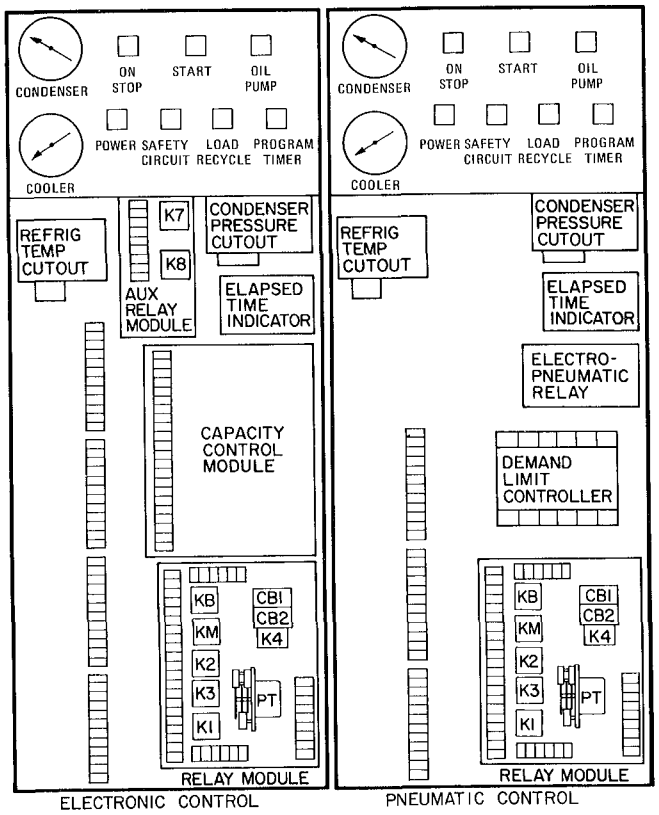
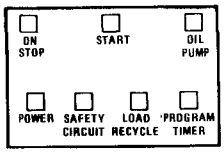


Fig. 6 – Control Center Components

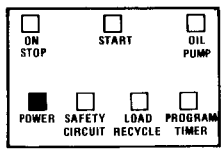
Check Operation of Safety Controls – As the following checks are made, control panel lights should appear as indicated in the diagrams.

□ – OFF ■ – ON

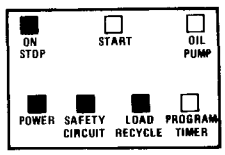
1. Open main disconnect (all power off to starter and controls). Disconnect main motor leads in starter.



2. Provide control circuit power from separate 115-volt source.



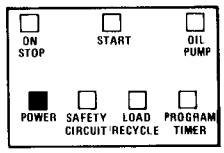
3. Press ON-STOP button (light goes on). If SAFETY CIRCUIT light does not go on, check resets on condenser high-pressure safety, low-refrigerant temperature safety, bearing and motor high-temperature circuit breakers and compressor overloads in starter. Check 3-amp fuse in control center.



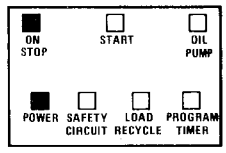
If SAFETY CIRCUIT light goes on but LOAD RECYCLE light stays off, check the chilled water recycle switch (auto-reset).

If both lights go on, manually trip and reset motor and bearing high-temperature circuit breakers, compressor motor overloads in starter, and low-refrigerant temperature cutout to be sure they cut off the safety light. Tripping the chilled water recycle switch will cut off the LOAD RECYCLE light only.

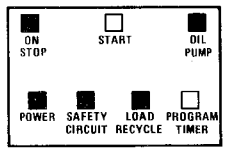
4. Press ON-STOP button (light goes out). Remove and tag gray striped wire from control center terminal (17).



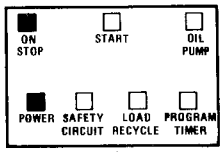
5. Start chilled water and condenser water pumps. Press ON-STOP button (light goes on).



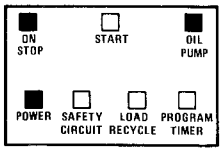
6. Press OIL PUMP button for several seconds. Pump should raise oil pressure 16 - 18 psi above refrigerant pressure at machine shutdown condition. SAFETY CIRCUIT and LOAD RECYCLE lights should go on.



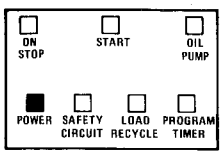
7. Release OIL PUMP button. SAFETY CIRCUIT light and LOAD RECYCLE light should go out.



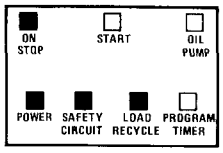
8. With OIL PUMP button depressed, alternately stop and restart chilled water and condenser water pumps. SAFETY CIRCUIT and LOAD RECYCLE lights should go out as each pump stops. (Continuous operation of oil pump is unnecessary during these checks.)



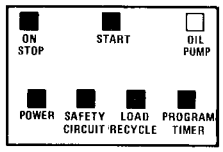
9. Shut off water pumps. Release OIL PUMP button. Press ON-STOP button (light goes out). Replace tagged wire on terminal (17).



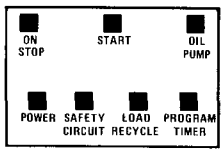
10. Press ON-STOP button (light goes on).



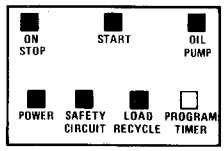
11. Press machine START button (motor leads disconnected).



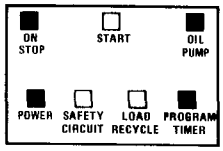
Oil pump starts within 30 seconds.



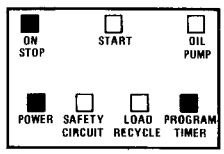
Compressor motor start contacts will close 30 seconds later. Starter will transfer to its run condition 30 to 60 seconds after starter is energized.



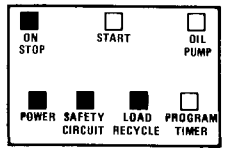
12. Open oil pump main disconnect. Starter must deenergize. OIL PUMP light will remain on for approximately 5 minutes.



OIL PUMP light goes out.



13. Close oil pump disconnect. In approximately 10 minutes the program timer will complete the antirecycle portion of its cycle and machine is ready to restart. (Total recycle time – 15 minutes.)



14. Remove all power. Reconnect motor leads. Restore power.

Purge – Place the purge operating valves (Fig. 1) in "Normal-Automatic" position as indicated in Operation no. 1 on the purge valve operation plate. Operate the purge momentarily by placing the purge switch in "Manual" position; then place purge switch in "Auto." position.

Air Supply (Pneumatic Controls Only) – Check 25 psi air supply to pneumatic temperature controller and pilot positioner.

START-UP

Before Starting Machine – Be sure that·

Power switch is on to circuit breakers, water pumps, tower fan and control circuit.

Cooling tower water is at proper level.

Oil is visible in reservoir sight glass.

Oil reservoir temperature is 140 F or warmer.

Oil cooler plug cock is cracked open and any other valve in the oil cooler line is fully open.

Refrigerant is at selected design level.

Valves in cooler and condenser water circuits are open *Do not permit water above 100 F to flow thru cooler*

Filter-drier shutoff valves (Item 24, Fig. 1) are open.

Air supply for pneumatic controls is adequate

COMPRESSOR ROTATION – Electronic Control: Set capacity control switch on "Hold."

Pneumatic Capacity Control: Turn off supply air to chilled water thermostat and vane positioner.

Press machine ON-STOP and START buttons. As soon as motor begins to turn, press machine ON-STOP button. Check motor rotation thru sight glass on motor end bell. Motor rotation must be counterclockwise as viewed thru sight glass.

COMPRESSOR OPERATION – Press machine ON-STOP and START buttons and let compressor come up to speed. Press machine ON-STOP button and listen for any unusual sounds from compressor as it coasts to a stop.

The program timer prevents rapid recycling and allows compressor restart 15 minutes after stop.

Checking Safety Control Settings

While performing these checks, carefully monitor chilled water temperature to prevent freeze-up. Protection by safety controls cannot be assumed until all settings have been confirmed as follows:

Open main disconnect (all power off to starter and controls).

Electronic Control: Set capacity control switch on "Hold."

Pneumatic Control: Ensure that pilot positioner operates as described in Setting Operating Controls-Pneumatic. Then set percent load

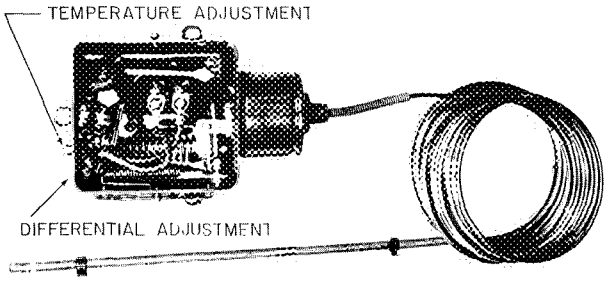
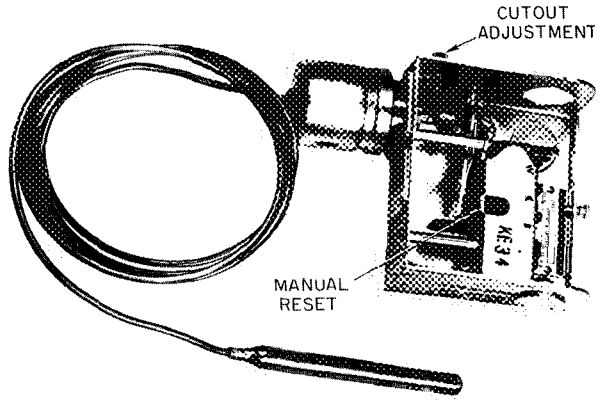
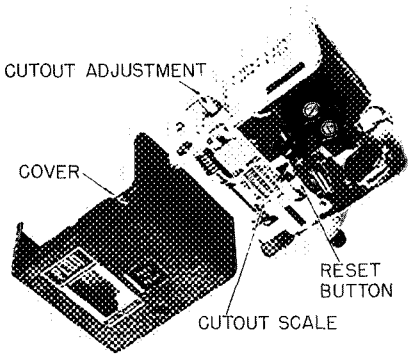
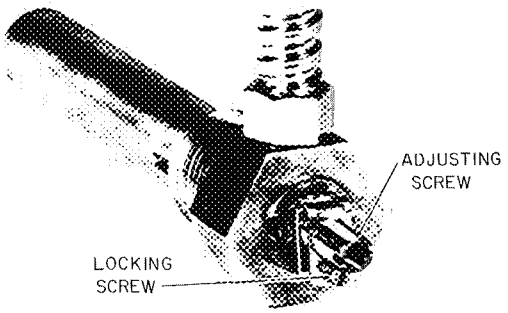
knob on demand limit control at 100% and turn calibration screw fully clockwise.

Place a clamp-on ammeter on one of the 3 starter leads. Be sure ammeter scale is set so that compressor full load amperage will register between midway and just under the top of the scale.

Install jumpers between [40] and (42), and between (10) and [11]. Close disconnects, start compressor and check oil pressure and temperature (Fig. 2). With compressor running, operate the guide vanes with capacity control switch or pneumatic thermostat. *Do not exceed 100% full load amps.*

1. Check controls 1 and 2 as indicated in Table 4.
2. Stop machine, open disconnects, remove jumpers and check controls 3, 4 and 5 as indicated.

Table 4 — Setting Safety Controls

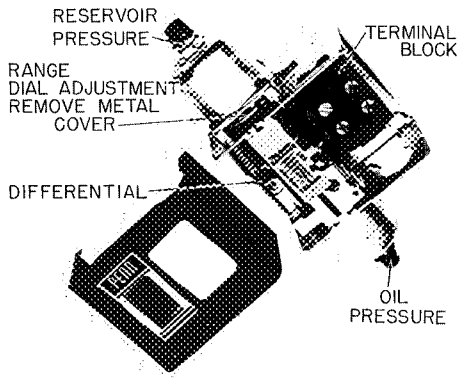
SAFETY OR CONTROL DEVICE	SAFETY OR CONTROL DEVICE
1. Chilled Water Low-Temperature Cutout and Recycle Switch (Fig. 1)  a Set this switch to break at approximately 5 F below design chilled water temperature, or at 36 F whichever is higher b. Set the differential at 10 ± 1 F so that when the machine shuts down automatically at approximately 5 F below the design chilled water temperature it will restart at approximately 5 F above the design water temperature. c This control must break ahead of the refrigerant low-temperature cutout switch or the machine will not recycle automatically	STOP MACHINE, REMOVE JUMPERS AND PERFORM REMAINING CHECKS.
2. Refrigerant Low-Temperature Cutout (Fig. 6)  Set refrigerant low-temperature cutout at 33 F or one degree below design refrigerant temperature, whichever is lower, while checking temperature at thermowell near control center	**3. Condenser High-Pressure Cutout (Fig. 6)**  The condenser high-pressure cutout is factory set to shut the machine down when condenser pressure reaches setting listed. Isolate the switch and check setting with a metered supply of air
	4. Oil Heater Thermostat (Fig. 2)  Set the oil heater thermostat to maintain a minimum oil reservoir temperature of 140 F at shutdown.

REFRIG	SETTING
11	15 psig
114	45 psig

Table 4 — Setting Safety Controls (contd)

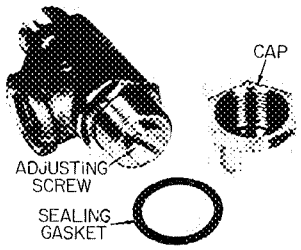
SAFETY OR CONTROL DEVICE	SAFETY OR CONTROL DEVICE

5. Low Oil Pressure Cutout (Fig. 2)



Low oil differential pressure switch is factory set to open at 5 5 ± 1 psi and close at 12 5 ± 1 psi differential pressure Operate oil pump manually Remove cap and gasket from regulating valve and loosen locknut Turn adjusting screw counterclockwise to lower oil pressure to 5 psi differential If safety does not trip, turn range dial clockwise until cutout occurs

6. Oil-Pressure Regulating Valve (Item 6, Fig 2).



REFRIG	SETTING*
R-11	15 psid
R-114	15-20 psid

*Settings given are above reservoir pressure

Remove cap and washer and loosen locknut Turn adjusting screw clockwise to raise oil pressure

7. Vane Speed Valve (Electronic Machine Only)

Angle valve is located between oil line to main bearing and "F" and "G" solenoid valves (Items 8 and 9, Fig 2) Set valve at full open position

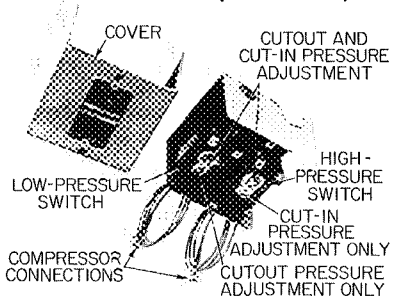
8. Chilled Water Flow Switch

Field supplied and installed Follow switch manufacturer's instructions for adjustment and maintenance

9. Main Bearing Oil Temperature (Item 14, Fig. 2).

During machine operation, gage should read 145-160 F Adjust water flow thru oil cooler with plug cock (item 11, Fig. 2) Do not exceed 7 gpm or pressure drop of 5 psi Do not exceed 200 psig working pressure

10. Dual Pressurestat for R-114 Pump-Down Compressor



High-pressure switch to open on rise at 45 0 psig Low-pressure switch to open on fall at 2 0 in Hg vacuum

Set high-pressure switch by operating compressor and throttling pump-down condenser water while watching pressure gage

Set low-pressure switch by operating compressor and gradually shutting suction valve while watching pressure gage

Setting Operating Controls — Electronic

MOTOR CURRENT CALIBRATION (Electronic Capacity Control)

1. Establish a steady motor current value for this calibration. Open guide vanes manually (capacity control to "Inc") until full load current is reached. Motor current calibration (Fig. 7) may need to be turned counterclockwise to permit vanes to open further. *Do not exceed 105% of nameplate full load amperes.*

   If system load is sufficient to maintain full load current for a period of time, calibrate at this condition. With small loads, pull down to and maintain design leaving chilled water temperature (capacity control at "Hold") and calibrate at this condition.
2. Measure motor current at selected condition. Determine its percentage of full load motor current.
3. Use this percentage figure to set the electrical demand adjustment (Fig. 7) per the following table:

Percent of Full Load Motor Current	Electrical Demand Adjustment Setting
105	100%
85 or above	80%
65 to 84	60%
45 to 64	40%
below 45	Control cannot be calibrated

4. Turn the motor current calibration adjustment fully clockwise. The guide vanes will close part way.
5. Turn the thermostat adjustment (Fig. 7) to "Cooler" (fully counterclockwise).
6. Set capacity control at "Inc" position.
7. Slowly turn the motor current calibration counterclockwise. Allow the guide vanes to open until motor current reaches 5% above the electrical demand setting.

   NOTE: There is a time lag of several seconds due to feedback capacitance in the motor current circuit. When the motor current calibration setting is adjusted, allow for this time lag.

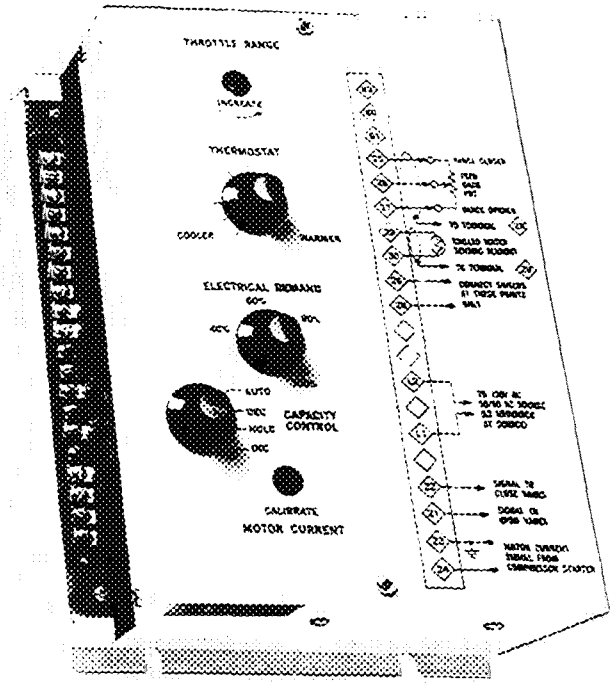


Fig. 7 – Capacity Control Module (Electronic Control)

8. Check the foregoing motor current calibrations with machine under "Auto." control as follows·
   a. Close vanes manually (capacity control to "Dec").
   b. Turn capacity control to "Auto." Vanes should stop opening at electrical demand setting.
9. If control was calibrated at less than 100% load, turn electrical demand adjustment setting to 100%. Control is now automatically calibrated for 100% full load current.
10. If control cannot be calibrated with above procedure, check voltage signal from signal resistor in starter. At 100% full load current, voltage between terminals 23 and 24 inside control center must be 0.5 ± 0.1 volts. If not in this range, check sizing of resistor in starter.

Both excess motor current and chilled water temperatures below the thermostat set point (Fig. 7) will override the capacity control setting. If the capacity control knob is in the "Inc" position, the guide vanes will stop opening. With the knob in any of the other positions, the vanes will close as needed.

The motor current limiting circuit operates in 2 steps.

At 100% full load motor current, the vanes will stop opening further. If the motor current should increase to 105% due to some change in load conditions, the vanes will close until the motor current is reduced to about 102%.

If the motor current is reduced to 98% or below, control again operates in response to chilled water temperature.

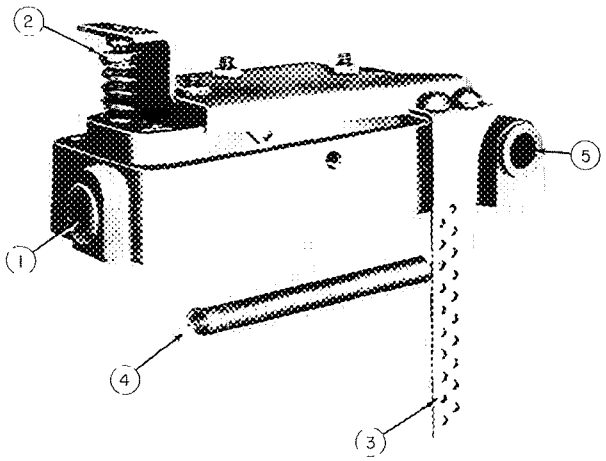
The electrical demand adjustment permits the operator to set the maximum current drawn by the motor and thus minimize the electrical demand rate during off-season operation.

CHILLED WATER CALIBRATION (Electronic Controls)

1. Turn throttle range adjustment (Fig. 7) fully clockwise.
2. Turn chilled water thermostat until design chilled water temperature is maintained. Mark thermostat at this position. If capacity control vanes hunt, turn throttle range adjustment counterclockwise in small increments until hunting ceases. Chilled water thermostat may require resetting.

Setting Operating Controls – Pneumatic Capacity Control

PILOT POSITIONER



ITEM	DESCRIPTION
1	MAIN AIR CONNECTION (25 PSIG)
2	STARTING POINT ADJUSTMENT NUT
3	LEVER ARM
4	FOLLOWER SPRING
5	PILOT AIR CONNECTION (FROM CONTROL CENTER)

Preparation:

a. Place jumper between field wiring terminal (L1) and load limiting module terminal (7).
b. Open 25 lb air supply valve.
c. Remove cover from pilot positioner.

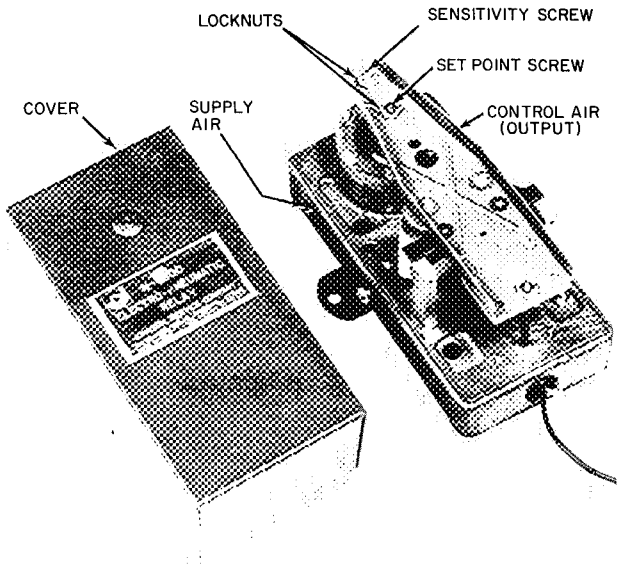
Calibration:

Rotate dial on chilled water thermostat to vary pilot pressure. Observe pressure gage in pilot supply line near pilot positioner and adjust starting point nut (2) until piston operator begins to move at 5 psi pilot pressure. Place follower spring (4) in proper hole in level arm so that piston operator opens 100% at 15 psi pilot pressure.

Completion:

Remove jumper from terminals (L1) and (7). Replace cover.

ELECTRO-PNEUMATIC RELAY

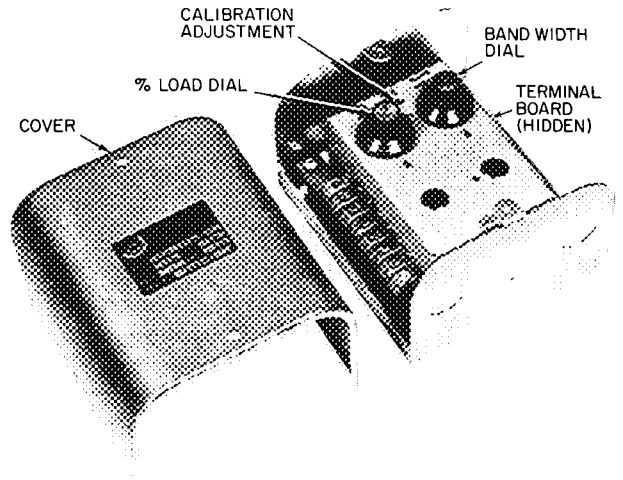


This control is factory calibrated to provide a linear output signal of 3 psi at 6 volts d-c to 18 psi at 15 volts d-c. Field recalibration should not be necessary.

If calibration is required:

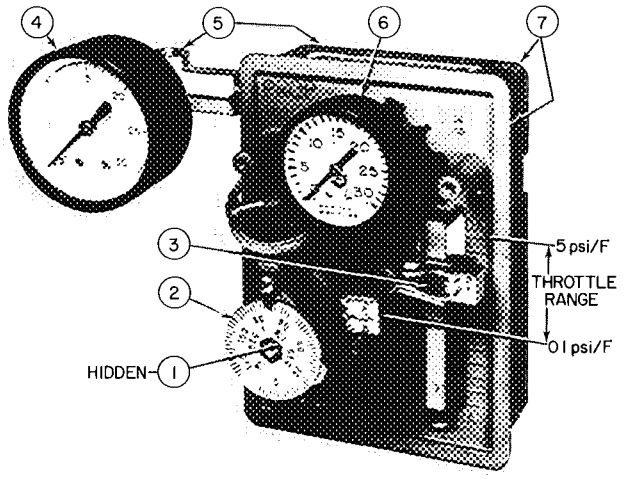
1. Establish 15 volt d-c input with 25 psi supply air.
2. Turn sensitivity screw to obtain 18 psi or higher output.
3. Adjust setpoint screw, if required, to set output at 18 ± ¼ psi.
4. Reduce input to 6 volts. Output should be 3 ± ¼ psi. If low, turn sensitivity screw carefully clockwise. If high, turn screw counterclockwise.
5. Recheck output at 15 volts. Repeat steps 3 and 4 if necessary.

DEMAND LIMIT CONTROL



1. Set percent load dial at 100%.
2. Set band width dial at 3.
3. Turn the calibration adjustment screw fully clockwise.
4. Run machine at 100% FLA by adjusting dial on chilled water thermostat.
5. Turn calibration adjustment screw counterclockwise until guide vanes just begin to close.
6. If hunting occurs, increase bandwidth and repeat steps 4 and 5.
7. If control cannot be calibrated with above procedure, check voltage signal from resistor in starter. At 100% full load, voltage between terminals 23 and 24 inside control center must be 3.0 ± 0.1 volts. If not in this range, check sizing of resistor in starter.

CHILLED WATER THERMOSTAT (Pneumatic)



ITEM	DESCRIPTION
1	SET POINT ADJUSTING SCREW
2	THERMOSTAT DIAL
3	SENSITIVITY SLIDER
4	SUPPLY AIR PRESSURE GAGE
5	SUPPLY AIR CONNECTIONS
6	CONTROL AIR PRESSURE GAGE
7	CONTROL AIR CONNECTIONS

Preparation:

1. Ensure 25 psi supply air to thermostat.
2. Loosen Allen setscrew in sensitivity slider and move slider halfway between midpoint and DA. Retighten screw.

Calibration:

1. Turn thermostat dial until control air registers 15 psi.
2. Operate machine to reach design chilled water temperature at design load. Maintain 15 psi control air during pulldown by adjusting thermostat dial as required.
3. On reaching design chilled water temperature, turn dial until control air pressure holds machine at design conditions.
4. Hold set-point adjusting screw stationary within the dial post and set the thermostat dial at design chilled water temperature.

Completion:

If vane hunting occurs, move sensitivity slider away from DA. Throttle range may be narrowed or widened by moving slider between the limits of 0.1 psi/F at midpoint to 5 psi/F at DA.

FINAL MACHINE ADJUSTMENT

Trimming Refrigerant Charge – After the machine has been placed in operation, it may be necessary to adjust the refrigerant charge to obtain optimum machine performance.

When machine full load is available, using the extra 200 pounds of refrigerant, add refrigerant slowly until the difference between the leaving chilled water temperature and the cooler temperature reaches design conditions or becomes a minimum. Shut the machine down and allow refrigerant to drain to the cooler, mark the level indicator and maintain that shutdown refrigerant level.

INSTRUCTING THE CUSTOMER OPERATOR

Be sure the operator carefully reads and understands the 19CB Operating and Maintenance Instructions.

Point out the following machine components, explain their function and that of the system in which they are used.

1. Compressor–Motor Assembly

a. Guide Vanes, Vane Positioner
b. Refrigerant-Cooled Motor

2. Cooler-Condenser-Economizer

a. Float Chamber, Sight Glasses
b. Thermowells
c. Rupture Disc
d. Refrigerant Charging Valve

3. Purge System

a. Importance of proper operation
b. Valves and System Operation
c. Sight Glasses, Gage

4. Filter-Drier System

a. Cartridge Removal
b Moisture Indicator Check
c. Shutoff Valve Function

5. Lubrication System

a. Oil Pump, Cooler, Filter
b. Solenoid Valve, Plug Cock
c. Heater, Thermostat, Temperature Gage
d. Pressure Regulating Valve
e. Oil Level, Temperature

6. Control System

a. Manual Switches (ON-STOP, START, OIL-PUMP)
b. Gages and Lights
c. Safety Controls
d. Operating Controls
e. Auxiliary and Special Controls

7. Auxiliary Equipment

a. Starter(s)
b. Pumps
c. Cooling Tower
d. Pumpout System (where applicable)

Describe Refrigeration Cycle

Review Maintenance

1. Scheduled
2 Extended Shutdown
3 Importance of Log Sheet
4 Importance of Water Treatment

Check Operator Knowledge

1. Start-Stop Procedure
2 Safety and Operating Controls

Discuss Carrier Service

1. Availability
2. Method of Ordering Parts

Review Operating and Maintenance Instructions